Influence of eye-movements on multisensory stimulus localization: experiments, models and robotics applications

Mathieu Lefort, Jean-Charles Quinton, Simon Forest, Adrien Techer, Alan Chauvin, Marie Avillac

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Objectives:

Multimodal merging in autonomous agent
– Identification (what to merge) → statistical correlations
– Fusion (how to merge) → how to get weighting?
Hypothesis: active perception

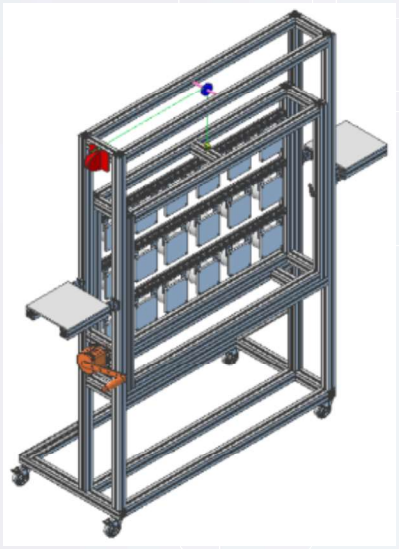
Partners:

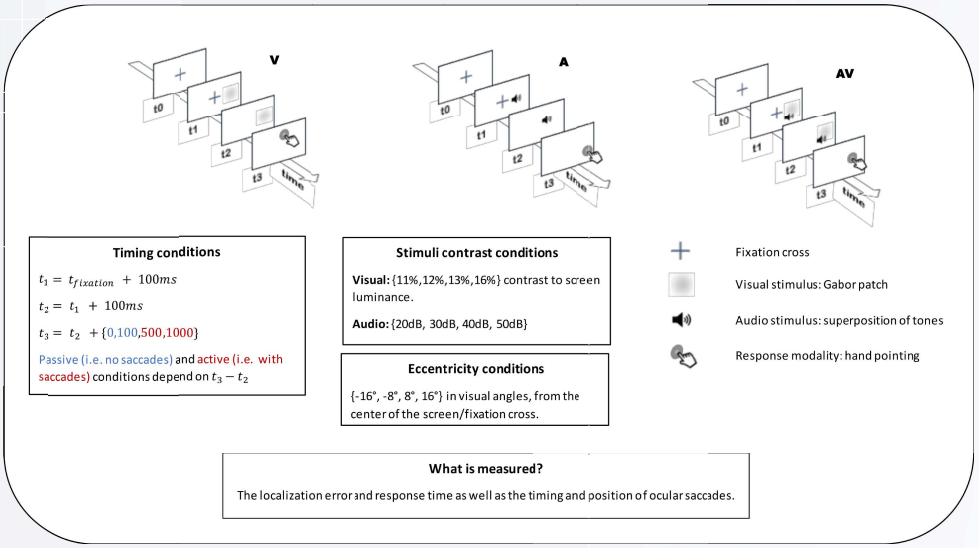
– Lyon 1 University (LIRIS, CRNL)
– Univ. Grenoble Alpes (LJK, LPNC)
– Hoomano

Funding:

– CRNL
– PERSYVAL-Lab LabEx
– the CNRS' Interdisciplinary Mission
– the Auvergne-Rhône-Alpes Region

Psychophysics experiments (ongoing work):



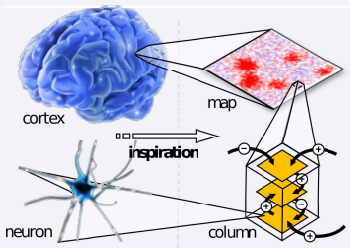


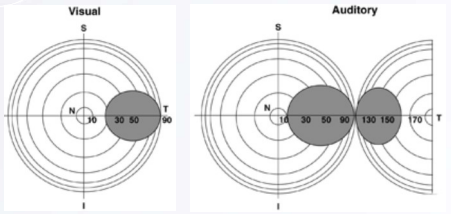
Modeling of superior colliculus (ongoing work):

Hypothesis: active perception provides more cues on sensory relevance
– log polar visual encoding in the superior colliculus may provide more weight to the centered stimuli (after saccade)

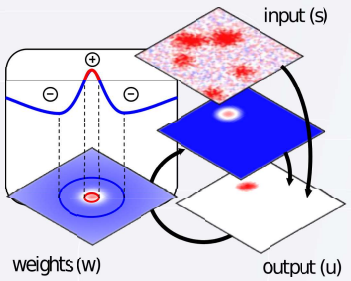
Modeling: **Dynamic neural fields**
– mesoscopic modeling (of the cortical surface)
– good model for saccade dynamic (motor command in the superior colliculus)
– dynamical system of spatial competition/fusion

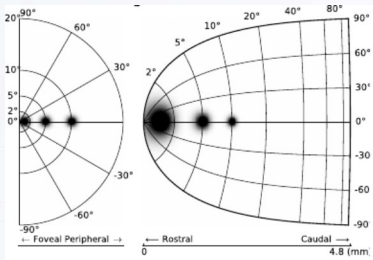
Open questions:
– frame of reference of visuo-auditory stimuli
– individual and population neuronal merging operation
– variance encoding in DNF





Aligned receptive fields





Visual log polar magnification

Improving social robots (future work):

Open questions:
– Does the computational models adapt to noisy data of real robots?
– What dimensions are (contextually) relevant in attention and goal achieving?
– How to chain simple active perception decision within a global behavior?
– How to mix active perception with a global task completion?
– Does merging mechanisms apply from simple to more abstract stimuli?